

FOLDABLE CONTAINER**Field of the Invention**

The invention relates to containers made from a one-piece flat sheet, made of for instance, waterproof material so that the containers may be used to hold both liquids and
5 solids.

Background to the Invention

Foldable containers are known for use as vessels such as cups for holding drinks or foods for personal consumption. Such foldable containers are either simple in structure in
10 which case they will not retain their folded condition without hand or finger pressure being applied to them, or they are relatively complex structures including clamps or other devices for attaching to the folded container body in order to maintain its folded condition.

15 There is a need for a simple foldable container, which may be maintained in its folded condition without using a separate fastening or other element which add to the overall complexity and cost of the article.

Statement of Invention

20 According to the first aspect of the invention, there is provided an open-top container constructed from a single sheet of material having fold lines enabling the sheet to be transformed from a flat condition into said container by folding said material about said fold lines, the container comprising a base and a plurality of side walls that extend from the base and define a rim of the container, the side walls being joined at each end thereof

by corners, wherein each corner comprises a flap formed from two folds extending from the rim and meeting at a point-junction with the base, the flap having an outside part that extends into one side wall, an inside part that extends into the adjoining side wall, and a middle part between said inside and outside parts, a first integral formation on one of said parts being interlocked with another of said parts to retain said flap in a folded condition.

Preferably, said first integral formation is a tag on the rim of the inside part of the corner, which tag is tucked into the space between said middle part and the outside part of the corner.

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Alternatively, said first integral formation may be a first notch in the rim of one of the inside and outside parts of the corner, which notch may be engaged with a second integral formation comprising a second notch in the rim of the other of the inside and outside parts of the corner. Preferably, the rim of one of said inside and outside parts of the corner has a tab, and the first notch is defined between the tab and that part, the notch opening at the fold line between that part and the middle part where it joins the rim.

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Preferably, the tab substantially fills the space between said walls at the rim of the container when the flap is in its folded position.

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Preferably, each notch has a root, the roots of each notch coinciding when the flap is in its folded position.

Preferably, the first and second notches are aligned when the flap is in its folded position.

Alternatively, said first integral formation may be a hook on the inside part of the corner, the hook being formed by a V-shaped cut in said inside part, which cut has two arms, the
5 first arm nearest said middle part extending to the rim and the second arm furthest from the middle part terminating at a distance from the rim, said second arm being aligned with the fold between said middle part and outside part when the flap is in its folded position, the fold between said outside and middle part parts being relieved from the rim to a depth substantially coincident with the top of said second arm of the V-shaped cut
10 when the flap is in its folded position, and so that the hook, when engaged with the fold between the middle and outside parts of the corner retains the flap in its folded condition.

Preferably, said relieving of the fold between said outside and middle part parts is achieved by cutting off the corner formed by said fold at the rim thereof.

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Preferably, a hinge is formed between said hook and inside part of the corner by a V-shaped fold line having a root and two limbs, the root coinciding with the top of the second arm of said V-shaped cut, and the limbs extending to the rim.

20 Preferably, one limb of said V-shaped fold line is aligned with the second arm of said V-shaped cut. Preferably, the other limb of said V-shaped fold line is substantially perpendicular to the second arm of said V-shaped cut.

Alternatively, said first integral formation may be a wing formed on both the outside part and middle part, the wing being formed by a fold line that extends from the rim of the middle part to the rim of the outside part, a second integral formation being provided in the form of a slot in the rim of the inner part, the inner part being relieved from the rim to
5 a depth substantially coincident with the top of the outside and middle parts when the wing is in a folded condition, so that the slot when engaged with the wing, retains the flap in its folded condition.

Preferably fold lines are defined between the base and side walls, which fold lines extend
10 between said point-junctions of adjoining corners.

Preferably said sheet of material is substantially hexagonal in shape, when unfolded and flat. Preferably, said sheet of material is a waterproof material. Preferably, said sheet of material is a plastics material, for example polypropylene. Said container may be in the
15 form of a bowl.

Brief Description of the Drawings

Preferred embodiments of the invention are now described, by way of example only, with reference to the accompanying drawings, in which:

20 Figure 1 shows a plan view of a container according to a first embodiment of the present invention, in its unfolded flat condition;

Figures 2a and b show a corner of the container of Figure 1 in a semi-folded and folded condition respectively;

Figure 3 shows a plan view of a second embodiment of a container according to the present invention, in its unfolded flat condition;

Figure 4 shows a plan view of a third embodiment of a container according to the present invention, in its unfolded flat condition;

5 Figure 5 shows a corner of the container of Figure 4 in a semi-folded condition;

Figure 6 shows a plan view of a variation of the container of Figure 4;

Figure 7 shows a corner of the container of Figure 6 in a semi-folded condition;

Figure 8 shows a plan view of a variation of the container of Figure 6 having composite corners;

10 Figures 9a and b show a corner of the container of Figure 8 in a semi-folded and folded condition respectively;

Figure 10 shows a plan view of another container in accordance with the present invention, in its unfolded flat condition;

15 Figures 11a and b show a corner of the container of Figure 10 in a semi-folded and a folded condition;

Figure 12 shows a plan view of another container in accordance with the present invention in its unfolded flat condition; and

Figure 13 shows a folded corner of the container of Figure 12.

Detailed Description of the Invention

Referring now to Figure 1 of the accompanying drawings, a first embodiment of a foldable container according to the invention is illustrated in its unfolded flat condition.

The container comprises a sheet of material 1 provided with a plurality of fold lines
5 scored into the body of the sheet.

The sheet 1 is substantially hexagonal in shape. In an alternative embodiment, the sheet 1 could be generally circular or any other suitable shape. Each edge of the hexagon is denoted 5a to f, the edges forming the rim 5 of the container in a folded condition.

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The sheet 1 is provided with base fold lines 2 defining a self-supporting triangular base 3, having corners 6a, b and c. By “self supporting”, it is meant that, when the container is in its folded condition, the base 3 allows the container to stand upright without the need for external support.

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Two fold lines 4,7, in V-shape formation, extend from each corner 6a, b and c to the rim 5. The fold lines 4 and 7 together define a middle part 8 of a corner 11. In the illustrated embodiment there are three middle parts 8, each generally triangular in shape. The fold lines 4,7 also define outside parts 8b and inside parts 8c, of the corner 11, as well as three
20 side walls, 16a, b and c that extend between the corners 11.

A tab 9 extends outwardly from an end of each of the edges 5a, c and e to a point junction 300. Each tab 9 has a curved outer edge 10. A notch 12 runs from the point junction 300 parallel the respective edge 5a, c, and e to a tear-stop aperture 13.

- 5 A second notch 14 extends inwardly from the edges 5a, c and e, from a point spaced and angled away from the fold line 7 into each of the side parts 8c. The notches 14 run to a tear-stop aperture 15.

The notches 12, 14 are positioned such that, when the corner 11 is folded, (see Figure
10 2b), the roots of the notches 12,14 are essentially coincident. Moreover, in this position they are in alignment with one another, and when engaged, they hold the corner 11 together. The apertures 13 and 15 prevent the notches 12 and 14 tearing.

To fold a corner 11, fold line 4 is folded inwardly towards the centre of the container so
15 that inside part 8b faces inwardly and middle part 8a faces outwardly (each with respect to the interior of the container). At the same time, fold line 7 is folded outwardly, so that outside part 8c also faces inwardly, but from behind middle part 8a. A flap 8 is thereby formed comprising the overlapping inside, middle and outside parts 8b, a and c respectively. Once the flap is formed, the tab 9 is able to fold across the middle part of
20 the flap such that the notches 12 and 14 can be maneuvered to engage one another and interlock. This effectively locks the corner 11 in a folded position.

Alternatively, as illustrated in Figure 3, the sheet 1 is not provided with a tab 9, but instead is provided with two notches, 20 and 21. Each notch extends from the edge 5 of the sheet 1 into a side wall, 16a, b and c, as the case may be. The notches 20 and 21, are positioned such that when the corner piece 8 is folded, using fold lines 7 and 4 to form a flap, as illustrated in Figure 2, the root of the notch 20 and the notch 21 are essentially coincident, and the notches 20 and 21 can be interlocked with one another.

A second embodiment of the invention is illustrated in Figure 4, in which a foldable container 1' is illustrated, in its unfolded flat condition. The container 1' comprises a sheet of material 22. The sheet 22 is provided with a plurality of fold lines, which have been scored into the body of the sheet.

The sheet 22 is approximately nonagonal in shape. The nonagon comprises six edges 23 of equal length, and three shorter edges, 24 also of equal length.

A first fold line 25 extends from a first end 26 of each short edge 24, to a point junction 27, 27' or 27'' as the case may be, on the sheet 22. The point junctions 27a, b and c are equidistant from one another, positioned such that upon folding of the container, the area between the point junctions is sufficient to form a self-supporting base of the container.

A second fold line 28 extends from a second end 30 of each short edge 24, to the point junction 27a, b or c, as the case may be. The fold lines 27 and 28 together define a corner middle parts 33a. In the present embodiment there are provided three corner

middle parts, each generally triangular in shape. The fold lines also define three inside parts 33b, and outside parts 33 c, as well as side walls 34.

5 A tab 29, trapezoidal in shape, extends outwardly from each edge 23, which is adjacent to the second end 30, of the adjoining short edge 24. The tab 29 is provided with two curved outer edges 31. A fold line 32 defines the base of the tab 29. The fold line 32 is the same length as, or slightly less, than the edges 24.

10 In order to transform the sheet 22 from a flat to a folded condition, inside part 33b is folded inwardly along line 28, so that middle part 33a faces outwardly, (with respect to the interior of the container). Outside part 33b is pushed outwardly, folding along line 25. A flap 33a,b,c is thereby formed, as illustrated in Figure 5. The flap extends from the rim to the point junction 27 of the two fold lines 25 and 28. The tab 29 is integral with the inside part 33b.

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Once the flap is formed, the tab 29 is then folded over the middle part 33a of the flap.

The interaction of the tab 29, the middle part 33a and the outside part 33c retains the flap and holds the corner 11' in folded position.

20 If preferred, fold lines may be provided between point junctions 27a, b and c in order to flatten base 40 between them.

A third embodiment of the invention is illustrated in Figure 6, in which a foldable container is illustrated in its unfolded flat condition. The container comprises a sheet of material 800. The sheet 800 is provided with a plurality of fold lines, which have been scored into the body of the sheet.

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The sheet 800 is approximately octagonal in shape. The sheet 800 comprises two long edges, each of equal length, 801, four shorter edges, 802 also of equal length and four corner edges 806.

10 The sheet 800 is provided with inner fold lines 803, which define a square self-supporting base 804. A fold line 805 extends from a point junction at each corner 806 of the self-supporting base 804. Each fold line 805 extends to a point junction 807 on each corner edge 806. A second fold line 809 extends from the point junction at each corner, 806 of the base 804. Each second fold line 809 extends to a point junction on each short
15 edge 802.

The fold lines 805 and 809 together define a middle part 816 of corners 11". In the present embodiment there are provided four middle parts, each generally triangular in shape. The fold lines 805 and 809 also define four side walls, two small side walls 814
20 and two larger side walls 818.

A third fold line 815 extends from the edge 802 across the corner piece 816 to a point junction on the edge 801. This defines a wing 817 that spans the corner piece and part of the adjacent wall 818.

- 5 A first downwardly inclined edge 810 extends from a first end 811 of each short edge 802 to the point junction 812 where the two edges meet. Two slots 813 and 813' extend from the point junction 812 into each side wall 814 in a V formation.

In order to transform the sheet 800 from a flat to a folded condition each of the corner
10 pieces 816 are folded towards the exterior of the adjacent side wall 814, using fold lines 805 and 809, such that the external surface of the corner piece 816 contacts the external surface of the adjacent side wall 818, forming a flap 819. The flap 819 has an outside part 820 that extends into the side wall 818, a middle part 823 formed by the corner piece 816, and an inside part 824 that extends into the side wall 814. The wing 817 is integral
15 with both the middle 823 and outside parts 820. The slot 813 is integral with the inside piece 824.

When the flap is formed, as shown in Figure 7, the downwardly inclined edges 810, relieve the rim (formed by edges 802) of the middle part 823, such that the depth of the
20 rim is substantially coincident with the top of the outside 823 and middle parts 820, when the wing 817 is in its folded condition. The wing 817 is therefore able to engage the slot 813, in the inside part 824, the interaction of the hook and fold retaining the corner piece 817 in a folded condition.

A fourth embodiment of the invention is illustrated in Figure 8, in which a foldable container is illustrated in its unfolded flat condition. The container comprises a sheet of material 50. The sheet 50 is provided with a plurality of fold lines, which have been scored into the body of the sheet.

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The sheet 35 is approximately iscosikaitetragonal in shape. In the present embodiment the iscosikaitertragon comprises four long edges each of equal length, 51 and twenty shorter edges, 52, 52', 52'', 52''', 52''''', also of equal length.

10 The sheet 50 is provided with inner fold lines 53, which define a self-supporting base 54. In the present embodiment the self-supporting base 54 is rectangular. Alternatively the self-supporting base is any other suitable shape.

The container 50, when folded, has four composite corners 65. Each corner comprises
15 two corners 11a,b similar to those described with reference to Figures 4 and 5 above. A first fold line 55 extends from a point junction at each corner 56, 56', 56'' and 56''' of the self-supporting base 54. Each fold line 55 extends to a first end 56 of each short edge 52'. A second fold line 57 extends from the point junction at each corner 56, 56', 56'' and 56''' of the rectangular base 54. Each fold line 57 extends to a second end 58 of
20 each short edge 52'. The fold lines 55 and 57 together define a first middle part 63a.

A third fold 59 line extends from the point junction at each corner 56, 56', 56'' and 56'''. Each fold line 59 extends to a first end 61 of each short edge 52'''''. A fourth fold line 60

extends from the point junction at each corner 56, 56', 56'' and 56''' to a second end 62 of each short edge 52'''. The fold lines 59 and 60 together define a second middle part 64a.

- 5 Together the fold lines 59 and 57 define the four composite corner pieces 65. The fold lines 55,60 also define inside parts 63b,64b respectively, as well as first and second side walls 66,67.

First tab 68 extends outwardly from each edge 52''. The edge 52'' serves as a fold line
10 at the base of the tab 68. Second tab 69 extends outwardly from each edge 52'''. The edge 52''' serves as a fold line at the base of the tab 69.

In order to transform the sheet 50 from a flat to a folded condition the external surface of each middle part 63a,64a is folded inwardly, as illustrated in Figures 9a and b. Once
15 each flap 63,64 is formed, the tabs 68,69 are folded over each middle part 63a,64a. The interaction of the tabs 68,69 with the middle parts 63a,64a and the outside parts 63c,64c retains corners 65 in a folded position.

A fifth embodiment of the invention is illustrated in Figures 10 and 11, in which a
20 foldable container is shown in its unfolded flat condition. The container comprises a sheet of material 70. The sheet 70 is provided with a plurality of fold lines, which have been scored into the body of the sheet.

The sheet 70 is provided with inner fold lines 73, which define a self-supporting base 74.

In the present embodiment the self-supporting base 40 is triangular. Alternatively the self-supporting base is any other suitable shape.

5 A fold line 75 extends from a point junction at each corner 76, 76' and 76'' of the self-supporting base 74. Each fold line 75 extends to a first end 76 of each short edge 72. A second fold line 77 extends from the point junction at each corner, 76, 76' and 76'' of the triangular base 74. Each second fold line 77 extends to a point junction 78, between a first downwardly inclined edge 80 and a second downwardly inclined edge 81. The first
10 downwardly inclined edge 80 extends from a second end 82 of each short edge 72 to the point junction 78. The second downwardly inclined edge 81 extends from a first end 83 of each long edge 71, to the point junction 78.

The fold lines 75 and 77 together define a corner piece 84. In the present embodiment
15 there are provided three corner pieces, each generally triangular in shape. The fold lines 75 and 77 also define three side walls, 85.

A hook 90 is formed in each side wall 85 by a downward V-shaped cut. The V-shaped cut has two arms 88 and 87. The first arm 88 extends to the edge 71. The second arm 87
20 terminates at a distance from the edge 71. The hook 90 is provided with a hinge comprising a V-shaped fold line having two limbs 401 and 402. Each limb extends from the edge 71 to a point junction 403 coinciding with the top of the second arm 87 of the V-shaped cut. The first limb 401 of the V-shaped fold line is substantially aligned with the

second arm 87 of the V-shaped cut. The second 402 of the V-shaped fold line is substantially perpendicular to the first limb 401. The hook 90 preferably has a tab 700.

In order to transform the sheet 50 from a flat to a folded condition, each of the corner
5 pieces 84 are folded towards the exterior of the adjacent side wall 85, using fold lines 75 and 77, such that the external surface of the corner piece 84 contacts the external surface of the adjacent side wall 85 beneath the hook 90 forming a flap 330. The flap 330 has an outside part 331 that extends into the side wall 85, a middle part 332 formed by the corner piece 84, and an inside part 333 that extends into the side wall 85'. The hook 90
10 is formed integral with the inside part 333.

When the flap is formed the downwardly inclined edges 80 and 81 relieve the rim (formed by edges 70 and 71) of the middle part 332 and the outside part 331, such that the depth of the rim is substantially coincident with the top of the arm 87 of the V-shaped
15 cut. The hook 90 is therefore able to engage the flap 330, between the middle 332 and outside 331 parts, the interaction of the hook and fold retaining the corner piece 84 in a folded condition.

In the foregoing embodiments, the inside and outside parts are generally interchangeable,
20 with the folds being reversed. The integral components on one part (ie notches, tabs or hooks) generally serve to interlock with the components on the other part in either direction. On the other hand, because of the resilience of polypropylene, (out of which the containers of the present invention are usefully constructed) some of the foregoing

designs only work well in one direction, where the curvature of the container is partly responsible for holding the corners together. This is true of the embodiment of Figure 4, for example, where the tab 29 must be folded outwardly (from the centre of the container) so that the flap is internal and helps press the tab into the gap between the middle and outside parts. A person skilled in the art can discover which designs suit different needs. For example, flap 9 in the embodiment of Figure 1 serves also to fill the gap that inevitably forms between adjacent side walls when a hexagonal shape is folded as described. The tab therefore provides an essentially smooth rim.

10 When constructed from waterproof material, the containers can obviously contain liquid without leaking. Moreover, they can be cleaned easily by wiping when unfolded. The present invention is primarily useful in forming bowls.